

R E M A R K S

Consideration of this application as amended is respectfully requested.

The abstract has been amended to better comply with the requirements of MPEP 608.01(b), and the specification has been amended to correct minor informalities of which the undersigned has become aware. And it is noted that the paragraph at page 10, line 17 to page 13, line 13 has been deleted because this paragraph was essentially an identical repeat of the immediately preceding disclosure in the Brief Description of the Drawings.

In addition, the claims have been amended to make minor grammatical improvements and to correct minor antecedent basis problems so as to put the claims in better U.S. form

Submitted herewith are marked copies of the changed pages of the abstract, specification and claims to show that no new matter has been added.

It is respectfully requested that the amendments to the abstract, specification, and claims be approved and entered.

And it is respectfully submitted that the amendments to the claims are not related to patentability and do not narrow the scope of the claims either literally or under the doctrine of equivalents.

In view of the foregoing, it is respectfully requested that prosecution on the merits proceed in light of this Preliminary Amendment.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,



Douglas Holtz, Esq.
Reg. No. 33,902

Frishauf, Holtz, Goodman, Langer & Chick, P.C.
767 Third Avenue - 25th Floor
New York, New York 10017-2023
Tel. No. (212) 319-4900
Fax No. (212) 319-5101
DH/sdf



VERSION MARKED TO SHOW CHANGES MADE

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joint lines extended vertically and four joint lines extended laterally;

Fig. 23 is a side view showing an image forming system in accordance with the embodiment in which images are projected from nine image projectors, which are arranged in the form of a lattice, on an optical sheet that has six joint lines extended vertically and four joint lines extended laterally; and

Fig. 24 is a front view showing an arrangement of partial images projected from nine image projectors, which are arranged in the form of a lattice, on an optical sheet that has six joint lines extended vertically and four joint lines extended laterally.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Various embodiments

An ~~embodiment~~ of the present invention will be described with reference to the drawings below.

~~Fig. 1 to Fig. 24 are concerned with one embodiment of the present invention. Fig. 1 is a side view showing the structure of an optical screen unit on which an image is projected from an image projector. Fig. 2 is a perspective view showing the arrangement of optical sheets and an optical plate which are included in the optical screen unit on which an image is projected from the image projector. Fig. 3A and Fig. 3B are a plan view and a front view showing~~

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a relationship between a joint line on the optical screen unit and the optical axis of the image projector. Fig. 4 is an enlarged view showing the arrangement of the optical sheets and optical plate in a direction in which they are layered. Fig. 5A and Fig. 5B are a front view and a side view showing a first example of a structure for resiliently supporting the optical sheets on a frame member. Fig. 6A and Fig. 6B are a front view and a side view showing a second example of the structure for resiliently supporting the optical sheets on the frame member. Fig. 7A and Fig. 7B are a front view and a side view showing a third example of the structure for resiliently supporting the optical sheets on the frame member. Fig. 8A and Fig. 8B are a front view and a side view showing a variant of the third example shown in Fig. 7A and Fig. 7B. Fig. 9A and Fig. 9B are a front view and a side view showing a fourth example of the structure for resiliently supporting the optical sheets on the frame member. Fig. 10 is an enlarged front view showing the structure for resiliently supporting the optical sheets on the frame member with a tension variation mechanism added thereto. Fig. 11 is a sectional view showing the internal structure of the tension variation mechanism. Fig. 12 is a perspective view showing an image forming system in which an image is projected from an image projector on an optical sheet having one joint line. Fig. 13 is a plan view showing

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the image forming system in which an image is projected from an image projector on an optical sheet having one joint line. Fig. 14 is a side view showing the image forming system in which an image is projected from an image projector on an optical sheet having one joint line. Fig. 15 is an enlarged plan view showing a desirable positional relationship between a joint line and rays projected from an image projector. Fig. 16 is an enlarged plan view showing an undesirable positional relationship between a joint line and rays projected from an image projector. Fig. 17 is a perspective view showing an image forming system in which three projectors project images on an optical sheet having one joint line. Fig. 18 is a plan view showing the image forming system in which three image projectors project images on an optical sheet having one joint line. Fig. 19 is a side view showing the image forming system in which three image projectors project images on an optical sheet having one joint line. Fig. 20 is a perspective view showing an image forming system in which images are projected by nine image projectors arranged in the form of a lattice on an optical sheet having three parallel joint lines. Fig. 21 is a plan view showing the image forming system in which images are projected by nine image projectors arranged in the form of a lattice on an optical sheet having three parallel joint lines. Fig. 22 is a

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~~perspective view showing an image forming system in which images are projected by nine image projectors arranged in the form of a lattice on an optical sheet 27 having six joint lines extended vertically and four joint lines extended laterally. Fig. 23 is a side view showing an image forming apparatus in which images are projected by nine image projectors arranged in the form of a lattice on an optical sheet 27 having six joint lines extended vertically and four joint lines extended laterally. Fig. 24 is a front view showing the arrangement of partial images projected from nine image projectors, which are arranged in the form of a lattice, on the optical sheet 27 having six joint lines extended vertically and four joint lines extended laterally.~~

According to a first embodiment, an

any image is, as shown in Fig. 1 and Fig. 2, projected from an image projector 1 on the major surface of an optical screen unit 3. The optical screen unit 3 has an optical plate 7 and, for example, two optical sheets 5 and 6 supported on a frame member 4. The optical plate ^{7, which} ~~that~~ is rigid, is located on the side of the frame member 4 facing an observer. The two optical sheets 5 and 6 ^{, which} ~~that~~ are flexible, are brought into close contact with each other over the major surface of the optical plate 7.

The optical plate 7 is formed with an acrylic plate or the like having a predetermined thickness. The optical plate 7 is rigid enough to hold the curved surface intact

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supporting pieces 11.

2 The other ends of the resilient members ^{12a}12 are fixed to two substantially central points on the short sides of the inner surface of the frame member 4. More particularly, tensile force is applied to the optical sheets rightward and leftward.

6 Owing to the structure, the magnitude of close contact of the optical sheets 5 and 6 with the optical plate 7 can be improved.

Next, referring to Fig. 9A and Fig. 9B, a description will be made on a fourth example of the structure for bringing the optical sheets 5 and 6 into close contact with the optical plate 7 by applying tensile force to the optical sheets.

As mentioned above, the optical plate 7 is fixed to and supported on the frame member 4 by means of an appropriate supporting structure.

Next, the optical sheets 5 and 6 have supporting pieces 11 attached to, for example, the center points of the short and long sides thereof and to the corners thereof. One end of a resilient member 12 that is, for example, a helical tension spring, is fixed to each of the eight supporting pieces 11.

The other ends of the resilient members 12 are, as shown in Fig. 9A, fixed to the center points of the long and

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WHAT IS CLAIMED IS:

1. An image forming system comprising:

an optical sheet having a plurality of sheet members ^{such that} joined ~~with the~~ margins of ^{each pair of} adjoining sheet members ^{meet} ~~met as a~~ to form a

joint line ~~so as to have one or more joint lines~~; and

^{a number of} image projectors each producing an image or a part of an image and projecting the image or the part of ^{the} ~~an~~ image to

said optical sheet through a projection optical system; ^{wherein} ~~when~~

^{a number of joint lines are formed and} the joint lines do not cross each other in said optical

sheet, the number of image projectors ^{is} ~~being~~ equal to or

larger than the number of joint lines, and when the joint

lines cross each other at a node in said optical sheet, the

number of image projectors ^{is} ~~being~~ equal to or larger than at

least ^a ~~the~~ number of nodes, and

wherein ^{such} ~~that~~ said image projectors are positioned ~~to cope~~

^{that:} (i) ~~when~~ ^{with either of a first case where only one node exists}

within a field in said optical sheet corresponding to the

image or the part of the image projected from an image

projector, ~~a second case where no node exists but only one~~

~~joint line exists, or a third case where no joint line~~

~~exists; in said first case, the optical axis of a projection~~

optical system meets the node to fit ^a ~~the~~ normal on ^a ~~the~~ major

surface of said optical sheet; ^{and (ii) when no node exists and only one} ~~in said second case, the~~

optical axis of ^{the} ~~a~~ projection optical system intersects the

one joint line is formed

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joint line at a point and is contained in a plane defined with the normal on the major surface at the point and the joint line.

2. The image forming system according to Claim 1, wherein ~~the~~ ^{at least one} node is formed ^{by} ~~with~~ convergence of four joint lines that are orthogonal to one another in the form of a cross or three joint lines that are orthogonal to one another in the form of a letter T.

3. The image forming system according to Claim 1, wherein ~~the~~ ^{a plurality of} joint lines are ^{formed which are} ~~parallel~~ to one another.

4. An image forming system comprising:

an optical sheet having two sheet members joined with the margins of ~~adjoining~~ ^{the} sheet members ~~not as~~ ^{meeting to form} a joint line ~~so as to have one joint line,~~ ^{said sheet members} and being substantially planar; and

a plurality of image projectors each producing a part of an image and projecting the part of an image to said optical sheet through a projection optical sheet,

wherein ~~the~~ optical axes of said plurality of image projectors are contained in planes defined ^{by} ~~with~~ the joint line and ^a ~~the~~ normal on ^a ~~the~~ major surface of said optical sheet.

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5. An image forming system comprising:

an optical sheet having three or more sheet members
^{such that} joined ~~with the~~ margins of adjoining sheet members ^{meet to form} ~~not as a~~
~~joint line so as to have~~ two or more mutually parallel joint
^{said sheet members} lines, ~~and~~ being substantially planar; and

a plurality of image projectors each producing part of
an image and projecting the part of an image to said optical
sheet through a projection optical system, ^{wherein} ~~one~~ or more image
projectors ^{are} ~~being~~ opposed to each of the two or more joint
lines, ~~and~~

wherein said image projectors are positioned so that
~~the~~ optical axes thereof ^{are} ~~will be~~ contained in planes defined
with the corresponding joint lines and ^a ~~the~~ normal on ^a ~~the~~
major surface of said optical sheet respectively.

6. An image forming system comprising:

an optical sheet having a plurality of sheet members
^{such that} joined ~~with the~~ margins of adjoining sheet members ^{meet to form} ~~not as a~~
~~joint line so as to have a plurality of~~ ^{respective} joint lines and one
or more nodes at each of which joint lines converge, ~~and~~ ^{said sheet}
^{members} being substantially planar; and

one or more image projectors each producing part of an
image and projecting the part of ^{the} ~~an~~ image to said optical
sheet through a projection optical system, ^{wherein} ~~one~~ image

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projector corresponding^S to each of the one or more nodes, and
wherein an image projector corresponding to a node is
positioned so that ^athe optical axis of a projection optical
system included in the image projector will meet the node
while fitting ^athe normal on ^athe major surface of said
optical sheet at the node.

7. The image forming system according to Claim 6,
further comprising one or more image projectors
corresponding to any points on the joint lines other than
the nodes, wherein the image projectors corresponding to any
points on the joint lines other than the nodes are
positioned so that ~~the~~ optical axes of projection optical
systems included in the image projectors will be contained
in planes defined with the normal on the major surface of
said optical sheet at the points on the joint lines, and the
joint lines.

8. An image forming system comprising:
an optical sheet having a unique portion whose optical
property is unique; and
an image projector for projecting an image to said
optical sheet through a projection optical system,
wherein said image projector is positioned so that a
solid angle formed with rays propagating from the projection

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optical system to the unique portion ^{is} ~~will be~~ minimized under a restriction on a predetermined positional relationship to said optical sheet.

9. An optical screen unit having a major surface on which an image is projected, comprising:

an optical plate having rigidity;
^{at least} ~~one or more~~ ^{flexible} optical sheet ~~being~~ ^a arranged over the major surface of said optical plate ~~and being flexible~~; and
a close contact means for bringing the major surface of said optical plate into close contact with ^a ~~the~~ major surface of said optical sheet.

10. The optical screen unit according to Claim 9, wherein said optical plate is curved so that the major surface thereof facing said optical sheet ^{is} ~~will be~~ a convex surface.

11. The optical screen unit according to Claim 10, wherein the convex surface ^{comprises} ~~is~~ a cylindrical surface.

12. The optical screen unit according to Claim 10, wherein a maximum magnitude of projection of the convex surface attained ^{when} ~~with~~ ^{is} no stress applied to said optical plate ranges from 2 mm to 100 mm.

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13. The optical screen unit according to Claim 9, further comprising a tensing means ^{for applying a} ~~that applies~~ tensile force, which is oriented at least along the major surface of said optical screen unit, to said optical sheet.

14. The optical screen unit according to Claim 10, wherein: ^P said close contact means includes ^{tensing} ~~close contact~~ means ^{for applying a} ~~that applies~~ tensile force, which is oriented along the major surface of said optical screen unit, to said optical sheet, and ^{means for applying a} ~~that applies~~ pressing force, with which said optical sheet is pressed against the convex surface of said optical plate, to said optical sheet; and ^P said optical sheet to which the tensile force is applied is pressed against the convex surface of said optical plate.

15. The optical screen unit according to Claim 14, further comprising a frame member that supports said optical plate, wherein said tensing means includes a resilient member having ^{a first} ~~one~~ end ~~thereof~~ supported on said frame member, ^{and a second} ~~having the other end thereof~~ coupled to said optical sheet, ^{to thereby exert the} ~~and thus exerting~~ tensile force.

16. The optical screen unit according to Claim 15, wherein a plurality of optical sheets are ^{provided} ~~included~~ and

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tensed mutually independently by a plurality of resilient members, and tensile forces applied to the respective optical sheets are oriented in ^athe same direction.

17. The optical screen unit according to Claim 15, wherein:

a plurality of optical sheets are ^{provided}~~included~~ and tensed mutually independently by a plurality of resilient members;

^a/tensile force applied to an optical sheet located farthest from said optical plate among said plurality of optical sheets has a component oriented to approach said optical plate;

^a/tensile force applied to at least one optical sheet among said plurality of optical sheets except the farthest optical sheet has a component oriented to recede from said optical plate; and

^a/resultant force of tensile forces applied to said plurality of optical sheets has a component oriented to approach said optical plate.

18. The optical screen unit according to Claim 15, wherein the convex surface of said optical plate ^{comprises}~~is~~ a cylindrical surface, and said resilient member tenses said optical sheet in ^athe perimetric direction of the cylindrical surface of said optical plate.

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19. The optical screen unit according to Claim 15, wherein said resilient member tenses said optical sheet in radial directions from ^athe center of the major surface of said optical sheet.

20. The optical screen unit according to Claim 15, wherein said tensing means further includes a tensile force adjusting means that enables adjustment of ^{the}tensile force exerted by said resilient member.

21. The optical screen unit according to Claim 9, wherein:

said optical sheet ^{comprises} ~~is constructed by joining~~ a plurality of sheet members ^{joined such that} ~~with the~~ margins of adjoining sheet members ^{meet to form} ~~met;~~ and ^{respective joint lines} at least one of ^{the} ~~one or more~~ joint lines ~~formed by~~ ~~joining the plurality of sheet members~~ is positioned so that ^{an} ~~the~~ optical axis of a projection optical system included in the image projector, which projects light on said optical screen unit, will intersect the one joint line.

22. The optical screen unit according to Claim 9, wherein ^{IP} ~~said~~ optical plate ^{comprises} ~~is~~ a diffusing plate; ^{IP} a plurality of optical sheets are ^{provided;} ~~included~~ and ^{IP} at least two of the

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optical sheets ^{comprise} ~~are realized with~~ lenticular lens sheets.

23. The optical screen unit according to Claim 22,
wherein ^a ~~the~~ side of said diffusing plate to be brought into
contact with said lenticular lens sheets is formed as a
diffusing surface, and ^a ~~the~~ side ^{of said diffusing plate} ~~thereof~~ opposite to the
diffusing surface is processed to become anti-glare.

24. The optical screen unit according to Claim 22,
wherein ^a ~~the~~ side of said diffusing plate to be brought into
contact with said lenticular lens sheets is formed as a
diffusing surface, and ^a ~~the~~ side ^{of said diffusing plate} ~~thereof~~ opposite to the
diffusing surface is processed to become anti-reflection.

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~~ABSTRACT OF THE DISCLOSURE~~

~~The present invention provides an~~ ^{An} image forming system
~~is provided which includes~~
~~consisting mainly of~~ an optical sheet and an image projector.

The optical sheet is constructed by joining a plurality of
sheet members with adjoining sheet members ^{meeting} ~~met~~ to form a
joint line. The image projector produces an image and
projects the image to the optical sheet through a projection
optical system. The relative positional relationship
between the image projector and optical sheet is such that
the optical axis of the projection optical system included
in the image projector perpendicularly intersects the joint
line in the optical sheet. Thus, reflection or scattering
of light at the joint line is minimized.

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